Claims

[c1] 1.A polarization sensitive optical substrate for discriminating between states of polarization of light, the optical substrate comprising:

a first surface;

a first optical film applied to the first surface, the first optical film having a thickness of $(1 + 2 \times k) \lambda /m/n_1$, where k and m are integers, λ is the wavelength of light incident upon the first optical film and n_1 is the refractive index of the first optical film; and

a second surface positioned in opposition to the first surface;

the optical substrate having a prescribed refractive index.

[c2] 2.The polarization sensitive optical substrate as set forth in Claim 1 wherein the first surface comprises a planar surface.

[c3] 3.The polarization sensitive optical substrate as set forth in Claim 1 further comprising a second optical film applied to the second surface, the second optical film having a thickness of $(1 + 2 \times j) \lambda /m/n_2$, where m and j are integers, λ is the wavelength of light incident upon the second optical film and n_2 is the refractive index of the second optical film.

[c4] 4.The polarization sensitive optical substrate as set forth in Claim 1 wherein the second surface comprises a first prismatic surface having a plurality of prisms, each prism having a plurality of facets intersecting at a peak so as to subtend a peak angle, α.

[c5] 5.The polarization sensitive optical substrate as set forth in Claim 4 wherein the first surface comprises a second prismatic surface having a plurality of prisms aligned along a second prism axis, each prism having a plurality of facets.

[c6] 6.The polarization sensitive optical substrate as set forth in Claim 1 wherein the first optical film comprises a metal oxide.

[c7] 7.The polarization sensitive optical substrate as set forth in Claim 3 wherein the second optical film comprises a metal oxide.

[c8] 8.The polarization sensitive optical substrate as set forth in Claim 5 wherein a

facet of the first surface and a facet of the second surface are positioned so as to subtend a prescribed angle, β , therebetween.

[c9] 9.The polarization sensitive optical substrate as set forth in Claim 4 wherein the second surface comprises a material having a refractive index different than the refractive index of the optical substrate.

[c10] 10.The polarization sensitive optical substrate as set forth in Claim 4 wherein the first prismatic surface includes a recessed notch positioned so as to have a notch axis oriented at an angle, ρ , with respect to the prism axis.

[c11] 11.The polarization sensitive optical substrate as set forth in Claim 10 wherein the recessed notch subtends a notch angle, Ω .

[c12] 12.The polarization sensitive optical substrate as set forth in Claim 4 wherein the plurality of facets form one or more compound facets respectively subtending an angle of η or κ with the base of the prism.

[c13] 13.The polarization sensitive optical substrate as set forth in Claim 4 wherein the plurality of prisms include a rounded peak with a radius R.

[c14] 14.The polarization sensitive optical substrate as set forth in Claim 4 wherein the plurality of prisms include a truncated peak wherein the truncation has a prescribed depth, s.

[c15] 15.The polarization sensitive optical substrate as set forth in Claim 1 further comprising a third optical film applied to the first optical film and having a thickness of $(1 + 2 \times k)\ \lambda\ /m/n_3$, where k and m are integers, λ is the wavelength of light incident upon the first optical film and n_3 is the refractive index of the third optical film wherein n_3 is different than n_1 .

[c16] 16.The polarization sensitive optical substrate as set forth in Claim 1 further comprising a multi-layered optical film stack applied to the first and second surfaces including a plurality of optical films having alternatingly relatively high refractive indices interleaved with optical films having relatively low refractive indices.

[c17] 17.A backlight display device comprising:

an optical source for generating light;

a light guide for guiding the light therealong;

a reflective device positioned along the light guide for reflecting the light out of the light guide;

a polarization sensitive optical substrate receptive of the light from the light guide for discriminating between states of polarization of the light, the optical substrate comprising:

a first surface;

a first optical film applied to the first surface, the first optical film having a thickness of $(1 + 2 \times k) \lambda / m / n_1$, where k and m are integers, λ is the wavelength of light incident upon the first optical film and n_1 is the refractive index of the first optical film; and

a second surface positioned in opposition to the first surface;

the optical substrate having a prescribed refractive index.

[c18] 18.The backlight display device as set forth in Claim 17 wherein the first surface comprises a planar surface.

[c19] 19.The backlight display device as set forth in Claim 17 further comprising a second optical film applied to the second surface, the second optical film having a thickness of $(1 + 2 \times j) \lambda / m / n_2$, where m and j are integers, λ is the wavelength of light incident upon the second optical film and n_2 is the refractive index of the second optical film.

[c20] 20.The backlight display device as set forth in Claim 17 wherein the second surface comprises a first prismatic surface having a plurality of prisms aligned along a prism axis, each prism having a plurality of facets.

[c21] 21.The backlight display device as set forth in Claim 20 wherein the first surface comprises a second prismatic surface having a plurality of prisms aligned along a prism axis, each prism having a plurality of facets.

[c22] 22.The backlight display device as set forth in Claim 17 wherein the first optical film comprises a metal oxide.

[c23] 23.The backlight display device as set forth in Claim 19 wherein the second optical film comprises a metal oxide.

[c24] 24.The backlight display device as set forth in Claim 21 wherein a facet of the first surface and a facet of the second surface are positioned so as to subtend a prescribed angle, β , therebetween.

[c25] 25.The backlight display device as set forth in Claim 20 wherein the second surface comprises a material having refractive index different than the refractive index of the optical substrate.

[c26] 26.The backlight display device as set forth in Claim 20 wherein the first prismatic surface includes a recessed notch positioned so as to have a notch axis oriented at an angle, ρ , with respect to the prism axis.

[c27] 27.The backlight display device as set forth in Claim 26 wherein the recessed notch subtends a notch angle, Ω .

[c28] 28.The backlight display device as set forth in Claim 20 wherein the plurality of facets form one or more compound facets respectively subtending an angle of η or κ with the base of the prism.

[c29] 29.The backlight display device as set forth in Claim 20 wherein the plurality of prisms include a rounded peak with a radius R.

[c30] 30.The backlight display device as set forth in Claim 20 wherein the plurality of prisms include a truncated peak wherein the truncation has a prescribed depth, s.

[c31] 31.The backlight display device as set forth in Claim 17 further comprising a third optical film applied to the first optical film and having a thickness of $(1 + 2 \times k) \lambda / m / n_3$, where k and m are integers, λ is the wavelength of light incident upon the first optical film and n_3 is the refractive index of the third optical film wherein n_3 is different than n_1 .

[c32] 32.The backlight display device as set forth in Claim 17 further comprising a multi-layered optical film stack applied to the first and second surfaces

including a plurality of optical films having alternatingly relatively high refractive indices interleaved with optical films having relatively low refractive indices.

[c33] 33.The backlight display device as set forth in Claim 1 wherein the first optical film is approximately 58 nm thick.

[c34] 34.The backlight display device as set forth in Claim 5 wherein the first prismatic surface 204 and the second prismatic surface have the same pitch, p, height, h, peak angle, α , length, l, and the peaks thereof are aligned along the same axis.

[c35] 35.The backlight display device as set forth in Claim 7 wherein the metal oxide is titanium oxide.

[c36] 36.The backlight display device as set forth in Claim 17 wherein the first optical film is approximately 58 nm thick.

[c37] 37.The backlight display device as set forth in Claim 23 wherein the metal oxide is titanium oxide.

[c38] 38.The backlight display device as set forth in Claim 1 wherein m equals four.

[c39] 39.The backlight display device as set forth in Claim 3 wherein m equals four.

[c40] 40.The backlight display device as set forth in Claim 15 wherein m equals four.

[c41] 41.The backlight display device as set forth in Claim 17 wherein m equals four.

[c42] 42.The backlight display device as set forth in Claim 19 wherein m equals four.

[c43] 43.The backlight display device as set forth in Claim 31 wherein m equals four.

[c44] 44.The backlight display device as set forth in Claim 4 wherein α is less than or equal to 80 degrees.

[c45] 45.The backlight display device as set forth in Claim 17 further comprising a diffuser receptive of the light from the optical substrate for diffusing the light.

[c46] 46.The backlight display device as set forth in Claim 45 wherein the diffuser comprises a retarder film for rotate the plane of polarization of the light exiting

the optical substrate so as to match the input polarization axis of an liquid crystal display.

[c47] 47.The backlight display device as set forth in Claim 46 wherein the diffuser comprises a textured or untextured polymer substrate stretched along one axis thereof in a plane of the substrate.